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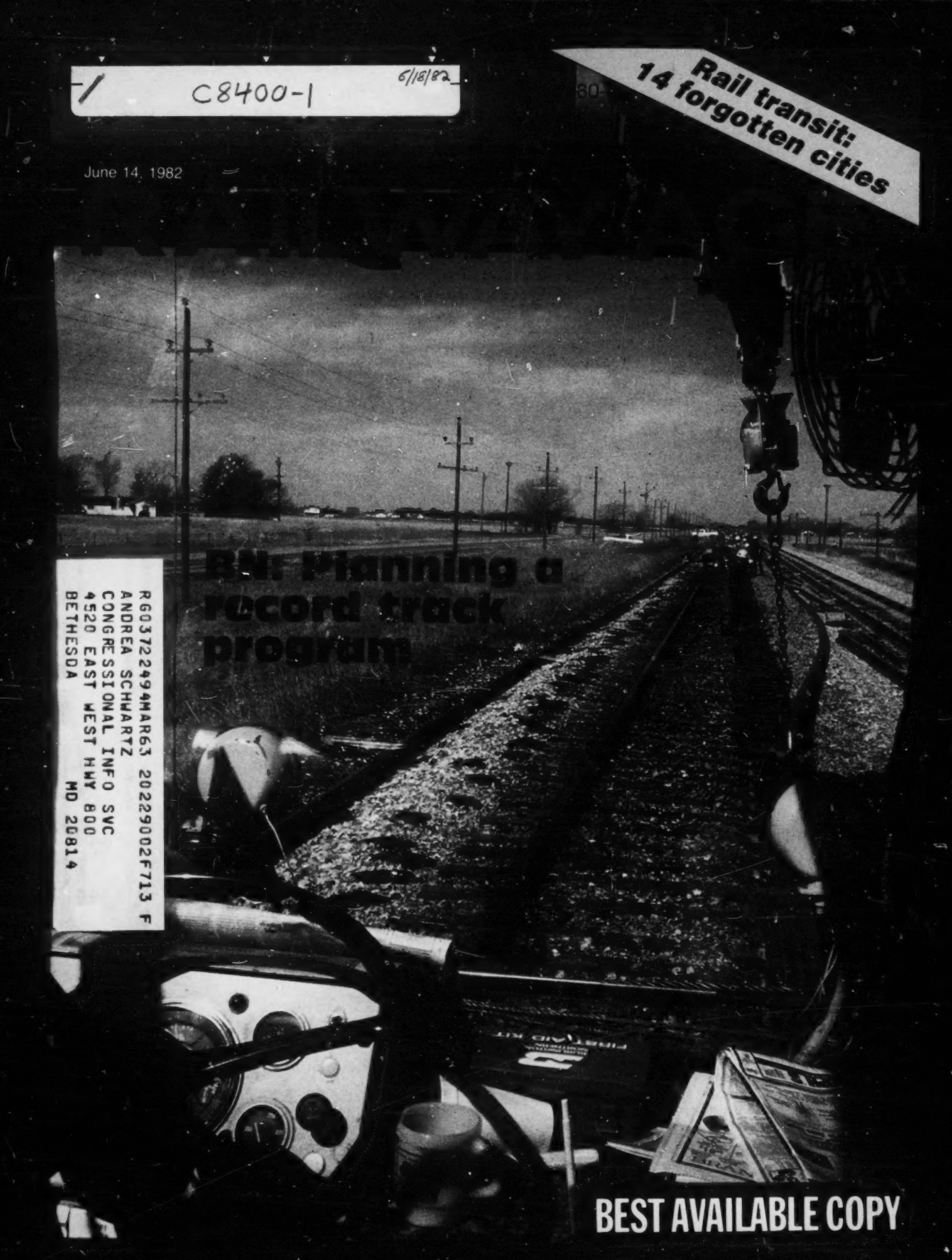
June 14, 1982

Rail transit: 14 forgotten cities



BN: Planning a record track program

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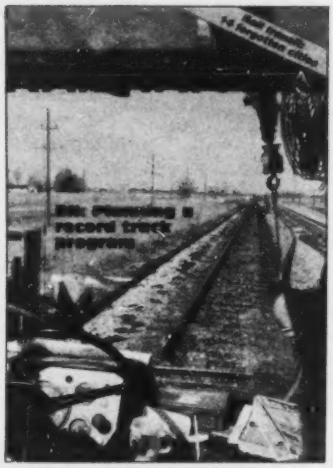
June 14, 1982

FEATURES



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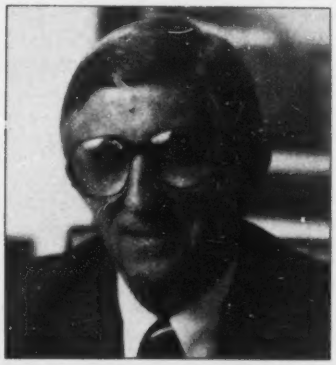

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Rail transit: Fourteen forgotten

The building boom of the past decade bypassed 14 cities that should be prime candidates for rail transit. That's the conclusion of a study that UMTA sponsored—and probably wishes it hadn't.

President Jimmy Carter thought rail transit cost too much and said so in a petulant handwritten note to his Transportation Secretary. President Reagan's DOT sees funding for new rail starts as a blob of fat that needs to be carved out of the federal budget. Little wonder, then, that neither the Carter nor the Reagan DOTs has embraced with enthusiasm the findings of an ongoing study that has turned up persuasive evidence that no fewer than 14 additional U.S. cities need some form of rail transit and can make it pay for itself—in energy, labor, land, and passenger-time savings.

This far-ranging study, which has already been granted landmark status by transit-industry experts, got under way several years ago, funded by DOT's Urban Mass Transportation Administration at a time when Washington was less hostile to rail transit than it has now become. Some of the findings were available to industry insiders as long ago as late 1980. But no attempt was made to make them public until a few weeks ago when the prestigious Regional Plan Association (RPA) of New York, New Jersey and Connecticut, which conducted the study, did so at a press briefing in Washington.

That briefing took place not at the DOT but at the Carnegie International Center. Officials of UMTA were present only as observers. UMTA has, in fact, been reluctant to comment at all on the study. One request for comment was brushed aside with the observation that the study was old news—although it did not, in fact, become news at all until the RPA's briefing. That briefing coincided with publication of the findings in book form by the Indiana University Press.*

What was "old news" to UMTA, however, was news indeed to planners in some of the 14 cities that the study identifies as prime candidates for cost-effective rail systems. These cities are Los Angeles, Seattle, Honolulu and Houston, all of which meet the study's criteria for rapid transit; and ten others that meet its criteria for light rail—Dallas, St. Louis, Milwaukee, Minneapolis, Indianapolis, Louisville, Cincinnati, Denver, Kansas City and Columbus. If the recommendations implicit in the study were carried out, the four rapid-transit cities would put in 180 miles of lines, and the ten light-rail cities would install around 200 miles.

But the RPA report goes farther than that. While the study concentrated on 29 cities that do not now have rail transit, it also applied its criteria to the "old" rapid transit cities (New York, Chicago, Philadelphia, Boston, San Francisco and Cleveland) and to those cities that are just now building or completing systems (Washington, Atlanta, Baltimore and Miami). In the former category, RPA identified 16 new corridors where 127 miles of new lines would meet its criteria; and in the latter, 10 corridors totaling 55 miles. It also found a potential need for 75 additional miles of light rail in cities with existing LRV or streetcar systems.

"Altogether," concluded Regional Plan Association Vice President Boris S. Pushkarev, principal author of the report, "potential additional rapid transit mileage in the United States conforming to the criteria presented here might total about 350 miles in 40 corridors, which represents about a 50% expansion of the extant 647-mile rapid transit system...Potential additional light rail mileage conforming to the criteria might total about 320 miles, which represents more than a doubling of the extant 215-mile light rail and streetcar system. Both items together would increase urban rail travel in the United

**Urban Rail in America: An Exploration of Criteria for Fixed-Guideway Transit*, by Borris S. Pushbarev with Jeffrey M. Zupan and Robert S. Cumella, 289 pp, $27.50. Indiana University Press, Bloomington.

Dallas

St. Louis

Louisville

Indianapolis

Cincinnati

Minneapolis

Denver

Columbus

Kansas City

cities

States by over 40% of 1980 levels of use."

Such a program, the Regional Plan Association estimates, would cost an estimated $25 billion in 1982 construction dollars—$19 billion for the rapid transit lines and $6 billion for the light rail. (Bid prices would be higher since they would anticipate inflation over a construction period of several years.)

• **"A positive tool."** One transit official who has studied the report carefully is John A. Dyer, general manager of the Southern California Rapid Transit District, and he is enthusiastic. He calls the study "a positive tool" and says SCRTD is using it "everywhere from City Hall to Congress" to promote a rail transit plan for Los Angeles. (Preliminary engineering is to be completed next month for an 18-mile starter rail line along Wilshire Boulevard. That line would cost $2.1 billion, of which $1.6 billion would have to come from a federal government that is now committed to a policy of no new federally-aided urban rail systems.)

But others are less well informed about the study's findings. General Manager Richard F. Davis of the Kansas City Area Transportation Authority says he has read about the report but hasn't seen it. Jerry Johnson, director of planning for the Dallas Transit System, told *Railway Age* he hasn't seen the report and only heard about the Washington briefing when he got a call from a local reporter.

It is no foregone conclusion, of course, that planners in all of the cities involved will rush out to hire engineering consultants even when they have thoroughly digested all of the exhaustive statistical data and the accompanying maps and analyses in the RPA report. But for those who *are* interested in pursuing rail-transit planning the study provides for the first time, as Regional Plan Association President John P. Keith puts it, "a uniform data base and a consistent set of analytical tools" to facilitate site-specific studies.

• **"A manual for alternatives analysis."** How can transit planners most effectively use the report? *Railway Age* put the question to Pushkarev in an interview in his New York office.

"First of all," said Pushkarev, "our report has numbers cities can use as a reference point for placing themselves in the continuum of existing systems. It provides a method for estimating travel volumes and for calculating what sort of system makes sense. It can be viewed as a manual for alternatives analysis on a national scale, providing a uniform and comparable methodology and data base."

While 17 existing programs were studied to develop "threshold" criteria for new systems, Pushkarev emphasizes that "we didn't stick to the averages. We looked at the best attainable performance given present circumstances. Some of the old studies, for example, looked at average labor requirements. But when you average in Boston, which has the highest labor requirement per unit of output on rapid transit in the nation, you come up with figures that are not really that different from buses on the average. So we didn't look at things on the average—we looked at specific corridors, specific volumes, and we assumed a labor situation that was the best practically attainable under current conditions in the country—for example, the situation that exists at PATCO."

• **Energy efficiency.** The RPA study's findings also differ from those of other studies in another important area—that of energy efficiency. After analyzing all factors influencing energy consumption by the various modes, direct and indirect, the report concludes:

"It makes sense to build rail transit even as a medium-term (22-to-45-year) energy conservation measure for nearly the full range of service volumes currently encountered on rapid transit, and for all but the lowest volumes currently encountered on light rail provided that the vehicle occupancy does not fall much below 23% of the places offered, provided that tunnel routing is used sparingly on the more lightly used lines, and provided that wayside and station energy costs are kept similar to those of the simpler systems, such as CTA, NYCTA, or PATCO."

Why have other studies—notably a well-publicized study conducted by the Con-

gressional Budget Office—found rail transit to be less energy efficient than highways and streets? Because, says the RPA report, others who have pondered the problem have fallen into one or more of the following traps:

"(1) Failure to fully account for the energy cost of highway fuel production and distribution.

"(2) An understatement of bus fuel use at slow urban speeds and of indirect bus energy requirements for maintenance of vehicles and streets.

"(3) An overstatement of indirect rail energy requirements, all too often patterned after BART simply because it has the best data. Methodological errors in this area include translating transit workers' wages into Btu's as an 'indirect energy cost' of rail. The energy cost of a piece of final demand (such as place-miles offered) is built up from streams of interindustry purchases. One cannot add workers' wages to this, since the energy purchased for some is but a different slice of final demand. These are not affected if transit workers were to be fired by a transit agency, for they would still need to consume Btu's in their private lives.

"(4) Exaggeration of the energy used for access trips to a rail line. Thus, one study assigns a false 30% penalty to combined auto-and-rail trips on the assumption that they are that much more circuitous than auto trips.

"(5) Failure to account for reduced auto ownership as a result of rail transit, a factor that strongly contributes to energy savings."

• **Rail transit and the automobile.** The RPA study broke new ground almost everywhere it turned—and when it turned to the relationship of rail transit and auto ownership, the findings were particularly revealing:

"The reduction of auto travel in the six [existing] 'rail regions' is much greater than that attributable to the direct replacement of auto travel by rail travel. On the average, auto travel per capita in the six major urban areas with rail was 30% lower than in four urban areas of comparable population size that had no rail in the early 1970s [Los Angeles, Detroit, Washington, and St. Louis]. Auto travel per capita in 'rail regions' was also 20% lower than in 42 urban areas with population in the 0.5 to 2.0 million range served by bus. Direct replacement of auto travel with rail travel would only suggest a 6% to 7% reduction in each case. The remainder can be attributed to lower auto ownership and less travel per auto in the 'rail regions.'

"The below-average auto ownership and use is not related to income; in fact, the median income in the 'rail regions' is slightly higher than in the regions without rail. Their freeway supply is also similar, with about 70 miles of freeway per million residents in each of the two groups in 1972.

"The principal reason for the suppression of both auto ownership and auto use is high density of development, especially in and near large downtowns, which are simultaneously made possible and stimulated by

Establishing travel-volume

"At what volume of traffic may a fixed guideway be justified?"

That was the basic question Boris Pushkarev and his associates asked as they sought to establish criteria for fixed guideway systems.

To arrive at an answer, they posed six other questions and analyzed data from existing systems to come up with some broad guidelines for transit planners.

The following summary is adapted from **Urban Rail in America.**

1. What is the maximum volume at which a fixed guideway can offer adequate space per passenger?

At the standard of 5.4 square feet per passenger, and at a frequency of 30 trains per hour, existing rapid transit systems in the United States and Canada have a maximum capacity of between 20,000 and 34,000 passenger places per track per direction in the peak hour, and anticipated light rail operations, up to 16,000....

Trains on more than half the 65 rail tracks entering downtowns in the United States and Canada do in fact provide 5.4 square feet or more per passenger during the peak hour. Still, 21 tracks—half of them in New York City—fail to meet this standard as a matter of operating policy: they could provide more space by running more trains. Only six tracks cannot meet the standard even if maximum service were provided; five are in New York and one in Montreal. Building new rail lines in the United States to relieve overcrowding is only relevant in New York. The highest volumes in other cities are no more than one-third of maximum capacity.

2. What is the minimum volume at which it can offer adequate service frequency?

To avoid excessive waiting time, no rapid transit or light rail operation in the United States and Canada schedules, as a rule, an interval between trains greater than 7.5 minutes (eight trains per hour) at downtown entry points within the peak hour. Taking this as a reasonable minimum service frequency and given practicable train lengths, the minimum volume per peak hour per direction becomes about 3,400 passenger places to support rapid transit and about 1,000 places to support light rail. These minimum volumes are equivalent to about 56 and 16 standard buses per direction per hour respectively. Such a level of peak-hour use at the downtown entry point translates to an average weekday bidirectional volume of about 15,000 passenger-miles per mile of the entire line on rapid transit, and on light rail and automated people movers to about 4,000 daily passenger-miles per mile of line. These are the lowest levels of existing service in the United States, called the *threshold of existing service* in the discussion below.

3. What is the minimum volume at which it can attain labor savings compared to bus operations?

Labor represents some 80% of the cost of operating public transportation, and increasing labor output is the key to reducing this cost. A comparison of 56 transit properties in the United States and Canada shows the following averages of labor output in passenger miles per worker per year:

85,000 on five automated peoplemovers;

150,000 on two peoplemovers with high passenger occupancies;

150,000 on buses with mostly local service;

160,000 on light rail and streetcars;

260,000 on rapid transit overall; and

310,000 on six new rapid transit systems.

These averages of output per worker are influenced by the passenger occupancy of the vehicles, operating speed, volume of service and service frequency, and by the manning of stations and trains. A labor requirements model is developed which responds to each of these factors and assumes that the overmanning typical of some older systems is avoided.

The model shows that to obtain lower labor costs per place-mile than typical urban buses (with their average 12 mph operating speed), very low volumes of service on fixed guideways are sufficient. On rapid transit and light rail, they are below the threshold of existing service. On automated peoplemovers, they are somewhat above.

To obtain lower operating costs than express buses operating at a speed equal to rapid transit or light rail (22-25 mph), volumes on rapid transit must be one-and-one-third to twice as high as the threshold of existing service, depending on service frequency, and those on light rail twice as high even with low service frequency; fully attended stations can only be provided at about three times the threshold of existing service.

At exactly what volume in this range the labor cost of rail falls below that of express buses if their speed is equal depends on the balance between the labor needed to operate vehicles and the labor needed to maintain the right-of-way; these vary from system to system. More important than the exact difference in average costs is the difference in marginal labor requirements to provide more service when traffic growth is anticipated. If the labor cost of a given amount of service in the range indicated is set equal to 1, then that of providing double the service by articulated express buses on busways is 1.9; by light rail, 1.7; by automated peoplemover, 1.6; and by rapid transit, 1.5 to 1.4.

4. What is the minimum volume at which it can attain energy savings compared to modes previously used?

In comparing the energy use of electric vehicles with those propelled by liquid fuels, energy losses at electric power plants and those in the refining and delivery of petrole-

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criteria for fixed guideways

um products must be accounted for. Compared that way in gross fuel use terms, rail cars and buses (including trolleybuses) have similar vehicle requirements for vehicle operation per passenger place. Buses need somewhat more energy at slow intracity speeds and less at high frequency speeds than railcars. Both are three times more efficient than the 1972-76 automobile in urban use, at 12 miles per gallon.

The difference in energy use between the auto and public transit will shrink in the years ahead but will not be eliminated. Meanwhile, the energy cost of electricity will fall as cogeneration reduces thermal loss at power plants. This will favor electric fixed guideway vehicles and trolleybuses, but will not be enough to make the electric automobile—with its battery-related energy losses—competitive in energy consumption with vehicles that rely on a continuous electric supply.

Apart from vehicle operation, energy is required for rail vehicle maintenance, manufacture, station, and right-of-way maintenance and guideway construction. The latter two are fixed costs: as service volume increases, their magnitude per unit of service declines. Construction energy does not affect the energy cost of existing systems, and even on new systems it is not clear whether it is a net drain of energy or not. Money spent for rail transit construction typically results in less energy use than the same amount spent for consumer goods and services which would be a likely alternative expenditure.

Determining at what point a fixed guideway will actually save energy requires an answer to the question, "Compared to what?" Two assumptions are made about the modes previously used, one reflecting a typical mix of former auto and bus use on the line-haul trip alone, the other including a sharp increase of feeder bus use to the rail line. The circuitousness of "before" and "after" trips appears to be similar, but depends in each circumstance on the street layout and the location of the rail line. No across-the-board adjustment can be made for it. Such an adjustment is necessary, however, for auto travel foregone due to reduced auto ownership near rail stations. At medium to high service volumes, one-third or more of the energy cost of rail transit can be free—paid for by savings from reduced auto ownership.

To save energy compared to modes previously used, amortizing construction over 22 to 45 years, an above-ground rapid transit line can have a travel volume below the threshold of existing service; if in tunnel, the needed travel rises to about double that threshold.

A light rail line above ground can begin to save energy with a travel volume roughly twice the threshold of existing service above ground and roughly seven times that in a tunnel.

A peoplemover of currently prevalent rubber-tired design in a downtown application can begin to save energy at volumes 10 to 20 times above the threshold of existing service. The poor energy-saving prospects of peoplemovers in downtowns are due to the previous mode of travel used by their users (assumed to be one-third pedestrians), the lack of any reduction in auto ownership (which occurs in residential areas), and high fixed energy costs of wayside maintenance and construction even in the absence of snowmelting, which alone can exceed the energy cost of vehicle operation.

In sum, it makes sense to build rail as a medium-term (22- to 45-year) conservation measure for the full range of travel volumes currently encountered on rapid transit and for all but the lowest light rail volumes, provided that tunnels are not used for light volumes, that station and wayside energy consumption is kept in scale with that of the simpler existing systems, and that passenger occupancy is maintained not far below 23.3% of places provided annually. This does not consider prospective change: regenerative braking that will save energy and station air-cooling that will cost energy to improve trip quality.

5. What is the minimum volume at which it can attain savings in land compared to modes previously used?

To use the space taken up by a traffic lane on approaches to a downtown more efficiently than a freeway with some bus service, a rapid transit line requires a travel volume that is just below the threshold of existing service. For a light rail line to use space more efficiently than an arterial street lane, travel volume must be roughly at its threshold of existing service.

In addition, fixed guideways economize on land for downtown parking, which is reflected in dollars of parking costs saved.

When necessary, fixed guideways can avoid the use of land at the surface altogether by going underground at lower cost than freeways or busways, which require more ventilation and more room underground. Tunneling in lieu of elevated construction pays for itself in direct land value only at prime downtown sites—about $5.6 million an acre in 1977 prices. But other countries seem to feel that indirect community benefits justify much more extensive tunneling. If worldwide averages were taken as a norm, travel volumes in the light rail range in the United States would warrant placing from 10% to 35% of the guideway in tunnel. Travel volumes in the rapid transit range would warrant placing from 35% to 70% of the guideway in tunnel. With three exceptions (the major one being Washington) all urban rail systems in the United States, most notably Chicago, have far less mileage in tunnels.

6. What is the volume at which its construction cost becomes commensurate with recent investment decisions?

Half of a sample of 20 recent fixed guideway construction projects involved a capital investment of up to $1,250 per weekday passenger-mile in 1977 prices; three-quarters an investmentof up to $1,800. San Francisco's BART and Washington's WMATA were near the median. Atlanta's rapid transit Phase I, the Archer Avenue subway to Queens, New York, and the Airtrans peoplemover at the Dallas-Ft. Worth Airport were near the 75th percentile.

The investment per weekday passenger-mile gives an indication of the value which public decision makers have implicitly placed on providing service by fixed guideways. At the conception of most of the 20 projects reviewed, federal funding was more limited than it later became, so that a major local commitment was usually involved.

Prorated over an amortization period of 45 to 75 years (depending on the type of construction) and assuming a 3% or 4% constant-dollar interest rate, the median investment costs 15¢ to 22¢ per passenger-mile and the 75th percentile investment 22¢ to 31¢ in 1977 prices....

Past political decisions notwithstanding: are the savings in land, energy, labor and passenger time that fixed guideways provide commensurate with capital expenditures in the 15¢ to 31¢ per passenger-mile range?

The money values that one can place on these four "hard" savings are somewhat arbitrary. Making conservative assumptions, one can show that, at the threshold volume of existing rapid transit service, an expenditure of 15¢ per passenger-mile can be paid for about 35% from savings in time (reflecting trade-offs passengers now make between travel time and travel cost), 35% from savings in labor, 25% from savings in parking charges as a proxy for land savings, and 5% from savings in energy.

Making more liberal assumptions about the full economic value of energy conservation and about the proportion of auto travel diverted to a rail line, and assuming a travel volume at twice the threshold of existing service, a capital expenditure of roughly 22¢ per passenger-mile would be paid for 45% from reduced parking charges and 30% from reduced energy use, with the remaining 25% equally split between savings in labor and savings in time.

The important point is that between 5% and 30% of the investment in a rail transit line can be recouped by direct savings in energy: between 12% and 35% by savings in labor; and between 25% and 45% by savings in parking charges as a proxy for land savings, with the remainder attributable to time savings. Long-term concern with resources, land use, and urban form are not traded in the market place. The decisions about the worth of these long-term benefits must be essentially political.

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Total Miles of Line of Grade-Separated Rail Transit in the United States, 1870-1980

RAPID TRANSIT: Length of line or first track, as of year end (miles)

	1880	1900	1920	1940	1960	1970	1975	1980
New York ..... (1867)	32.2	64.6	216.1	277.0	265.0	265.4	258.9	258.0
Chicago ..... (1892)		41.4	71.1	82.4	67.5	89.4	89.4	89.4
Boston..... (1901)			16.1	19.5	24.3	24.3	32.9	36.7
Philadelphia..... (1907)			7.0	24.9	26.5	37.4	38.6	38.6
Cleveland* ..... (1955)					15.2	19.3	19.3	19.3
San Francisco ..... (1972)							71.0	71.0
Washington..... (1976)								37.2
Atlanta..... (1979)								11.8
Baltimore..... (1983)								
Miami..... (1984)								
Subtotal.....	32.2	106.0	310.3	403.8	398.5	435.8	510.1	562.0

LIGHT RAIL: Portions of line with fully grade-separated right-of-way, as of year end (miles)

Boston..... (1897)	1.5	5.7	4.5	14.7	14.7	14.7	14.7
Philadelphia..... (1905)		18.0	18.5	16.1	16.1	16.1	16.1
Cleveland..... (1920)		4.5	6.0	3.5	3.5	3.5	3.5
Rochester ..... (1927-56)			10.0				
Newark ..... (1935)			4.3	4.3	4.3	4.3	4.3
San Francisco ..... (1980)							6.2
Buffalo..... (future 1.2 miles at grade, 6.4 miles total)							
San Diego..... (1981) 15.5 miles has no fully grade-separated right-of-way							
TOTAL, grade separated**	32.2	107.5	338.5	447.0	437.1	474.4	548.7	606.8

* The Cleveland RT system shares 2.5 miles of line with Light Rail.

** In addition, there are 1.2 miles of grade-separated Light Rail in Forth Worth; reserved right-of-way Light Rail lines totaled 53.1 miles in 1980, and street-running lines, 100.5 miles.

Source: *Urban Rail in America*

rail access. To a lesser degree, this effect can also be observed in Baltimore and Pittsburgh, which did not have major rail systems in the early 1970s, but which did, historically, develop above average densities in the core.

"Density acts as a barrier to auto use by reducing speeds and increasing the costs of owning and operating an auto. In addition, auto ownership in urban cores is more sensitive to income than that in suburban areas, where auto ownership is more necessary even among low-income households.

"Not only are fewer autos owned in higher-density areas, but those that are owned are driven less. A recent study suggests that autos owned by lower-income households in urban core areas are driven about 25% less than those in suburban and about 20% less than those in rural areas. Those owned by middle- and upper-income households are driven about 20% less in urban areas than in suburban ones, and 30% to 45% less in urban areas than in rural ones."

All of this adds up, says RPA, to a big plus argument for rail: In the six "rail regions," not only were 11.6 billion vehicle-miles of auto travel diverted to rail annually; the six regions also had indirect savings amounting to 47.1 billion vehicle miles. That, points out RPA, "is more than all the annual auto travel in the Los Angeles region."

• Great expectations scaled down. While the RPA study's findings on the cost-effectiveness of urban rail may surprise and trouble Washington, those findings represent a substantial scaling down of the grand (and sometimes grandiose) plans of cities just a few years ago. It was, in fact, to get an independent agency's view of actual needs that UMTA comm.ssioned the study in the first place..

"There were exaggerated expectations in the late '60s and a lot of high flown plans that really did not make any sense, such as 80 miles of subway in St. Louis," Pushkarev recalled in the interview with *Railway Age*. "Those plans added up to something like 2,200 miles of rail rapid transit by 1990. Then the pendulum swung the other way, and President Carter said zero miles. What we are now trying to say is that the truth lies somwhere between these two numbers."

Pushkarev is not surprised at UMTA's cool-to-lukewarm reaction to RPA's fundings. "They of course are trying to avoid the political issue of how do you square the fact that rail systems make sense with the fact that they don't want to spend any money," he says. "And there has, of course, always been an anti-rail element within DOT."

"The importance and the benefits of urban rail are underestimated in the United States," he told the Washington news conference, and he made these points:

—Subways,streetcars and commuter rail in 1980 produced 17.4 billion passenger-miles of travel in the U.S.—three and a half times as much as Amtrak and nearly as much as all city buses put together.

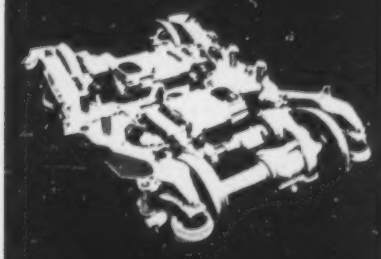
—In six major urban areas, peak hour travel by rail equals that on freeways. Cities with rail transit have at least as much per capita bus travel as other major cities, so rail service decreases driving, not bus riding.

—In 1980, the eight downtowns served by rapid transit and the two served by streetcar housed one-third of the *Fortune* 500 industrial corporation headquarters and two-thirds of the 300 largest non-industrial corporations.

—Worldwide, rapid transit mileage doubled in the 1960-1980 period, but the U.S. lagged.

It's time, believes Pushkarev, for the pendulum to start to swing the other way. If it does, Pushkarev and his associates at RPA can be credited with giving it a vigorous shove in the right direction. ■

Katja: I did not count cities in 2nd section of table that appeared in 1st.



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Speeding up waybill data exchange

The switch to electronic data interchange for transmission of waybill information is gaining momentum. It saves time and narrows the margin for error.

"Every time we put another railroad on line it's like money in the bank." That is how one Conrail official sees the benefits from the rapid introduction of Electronic Data Interchange (EDI) over the past several years. Railroads all across the U.S. are abandoning the time-consuming and error-prone shuffle of paper waybills and replacing it with instantaneous transmission of waybill data via computer to computer messages.

Where EDI has been accepted, freight-laden cars no longer have to wait for their marching orders to catch up with them. Instead, clerks know what to expect hours or days in advance, and car scheduling can be used to streamline operations. Today over 50% of all U.S. loaded freight cars move under EDI—and industry sources expect that by the end of this year 85% of that traffic will be covered by EDI. Major railroads are generally enthusiastic about the results and, as the accompanying table shows, most plan to send waybill data via EDI.

"EDI is the modern way to format messages," says Edward A. Guilbret, president, Transportation Data Coordinating Committee (TDCC). TDCC was formed in 1969 with the concept for EDI, though it was apparent that such a major change in industry communications could not come easily.

"Just describing the commodities was a difficult task," says Guilbret.

After nearly a decade of tests, three railroads started a demonstration project that proved EDI would not only work, but would deliver the anticipated cost savings.

Railroad	% of U.S. waybills originated	Using EDI
ATSF	3.5	Today
BAR	—	Today
BLE	1.0	Planned
B&M	—	Planned
BN	8.4	Today
CN	—	Planned
C&NW	3.8	Planned
Chessie	10.6	Planned
CP	—	Planned
CR	10.2	Today
D&RGW	.9	Today
DTI	.9	Planned
EJE	.9	Planned
Family Lines	12.7	Today
GTW	1.5	Planned
ICG	4.4	Planned
KCS	1.0	Today
MILW	2.1	Planned
MP	5.3	Today
NW	6.1	Planned
PLE	.6	Planned
RFP	—	Planned
Soo	—	Planned
Sou	5.9	Today
SP	6.6	Today
UP	4.8	Planned
WP	—	Today
	91.2	

• **Eliminating errors.** EDI has a number of applications inside and out of the railroad industry. For railroads, though, its most important use is in the transmission of waybill data. It speeds car movements, accelerates cash flow, and reduces error. It is the latter benefit that might be the biggest. Michael D. Sims, vice president, information systems, Conrail, estimates that one out of four paper waybills contains erroneous information. "Once you start producing waybills with a computer," he says, "you have predetermined logic that eliminates a lot of those errors."

The problem with paper waybills is that they have to be reproduced at least as many times as there are railroads in a given move. Each time a car moves from one railroad to another a clerk must retype the data from the delivering carrier's waybill onto another form for the receiving carrier. In such a chain mistakes are bound to happen.

With EDI, though, the originating carrier makes up the waybill and transmits it to Railinc in Washington, D.C., where there is a central switchboard for EDI. The Railinc computer looks at incoming waybills and transmits them to all the connecting carriers that can receive the information. Rather than taking days to move the data, this process is nearly instantaneous. And it transmits the waybills without making errors.

The use of EDI also reduces the chances of error in the original waybill because a series of logic checks screens out a number of common errors.

It is through the use of this hub at Railinc that EDI is able to function for railroads. Railinc was set up this year to assume the functions that had been conducted in-house at AAR through its Management Systems Department.

• **"An electronic window."** AAR decided that a for profit company could better handle the growing responsibilities of its data processing and communications services, as well as Train II (TeleRail Automated Information Network). Henry W. Meetze, former AAR vice president in charge of MSD, was named president of Railinc. Meetze has been able to trace the growth of EDI transmissions through MSD and Railinc, watching the number of messages burgeon over the past 18 months from 4,000 a month to over 53,000. "We have become an electronic window between railroads and other industries," says Meetze.

The development has been made possible by a series of policy decisions at AAR. In 1978 the organization first began using its national communications system to electronically switch messages between railroads. Shippers were brought into the network in 1980. With the formation of Railinc Meetze is able to fully develop the potential of EDI, and he looks toward the future with anticipation. "We are in an open market situation."

To take full advantage of that position, Railinc recently decided to allow the transaction of any business related data between two parties over its network. The only condition is that one of those parties must be a railroad.

Besides allowing Meetze to sell his services to a wider audience, these policies mean that railroads can now take advantage of electronic data interchange wherever it will be beneficial.

The Interstate Commerce Commission recently decided to allow waybills and loss and damage claims to move via EDI rather than paper. Family Lines has petitioned the ICC to allow EDI transmission of bills of lading, as well.

Railroads are moving into position, then, to sweep away a great flood of paper that has burdened the movement of freight trains for over 100 years. TDCC's Guilbret says EDI is a whole new way of communicating that is a big step beyond writing. "If at any point you require paper there is an edit for it," he says,

"but EDI is not designed to automate paper work."

• **Co-existence.** EDI has a language and format all its own, but importantly it can exist along with a railroad's in house communication network.

"Internally each company has many differences that you don't try to standardize," explains Guilbret. What you do is "standardize in between companies." EDI offers a standard method of communication between railroad, shipper, and others that allows everyone to meet and communicate on common ground.

Essentially, the typical EDI message is composed of individual data elements such as the name of a city, dollar amount, or transaction number. These are put into data segments that are separated by an asterisk. The segments are put into a transaction set, such as a waybill.

These messages can be transmitted and received by computers or terminals and, perhaps soon, even by simple word processors with the ability to communicate. By opening the EDI network to a large group, railroads hope to eventually send over 90% of their waybills via EDI.

With Guilbret, Meetze, and others predicting that 85% of all U.S. waybills will be transmitted electronically by year's end, the benefits of EDI are becoming apparent to most railroads. Already, in the grocery industry, TDCC has found that simply by moving 50% of that industry's volume under EDI there are savings of $120 million annually.

• **Reason for excitement.** No estimates are available of the potential savings within railroading, but there is reason to be excited, says R.C. Shamberger, chief, rail operations division, Federal Railroad Administration. Shamberger has been following and promoting the development of EDI for a number of years, and FRA has backed some of the research into EDI. Now, under the new Administration's drive to take government out of the private sector, FRA is withdrawing from active support of EDI research. Rather than being upset by this, Shamberger is buoyed by the "yield of the program that has been, in my view, beyond our anticipations." Further government involvement is unnecessary. Says Shamberger, "We won the game."

The basic thrust of EDI should be, he says, to take data and turn it into information. That information, in the right hands, can add to the knowledge of railroaders and shippers, and through that knowledge those people can become more insightful about their work. "That is what improves the quality of work life," says Shamberger.

Through EDI car scheduling can become more accurate, and equipment utilization can be improved. This will make railroads more attractive to shippers, because "the railroad is actually part of the production line," says Shamberger. "The truckers have viewed it this way for years."

The potential benefits of EDI, though, go beyond even transmitting waybills or loss and damage claims electronically. Using waybill information, railroads can know how traffic will be flowing over their routes two or more days in advance. "All of a sudden," says Shamberger, "you've got interline car scheduling."

A Missouri Pacific pilot program has shown that transmission of bills to shippers by EDI can speed payment by two days.

Conrail, one of the leaders in EDI development, is already taking partial advantage of this capability. Says Sims, "When we know a car will be unloaded within two days, we take the information and run it against our car strategy. If we find a use for that car then the computer assigns it a destination. If we can't find a use for it we tell the car management people that the car is available. They decide if they want to use the car or send it home." Sims estimates that this process saves Conrail a couple of days worth of per diem charges on the average car and keeps many cars from going into inventory.

"The thing we would like to see is for more railroads to find uses for the waybill data other than for transportation purposes."

• **Expedited cash flow.** Another pioneer in the use of EDI has been Missouri Pacific and its vice president, information and control systems, G.S. Sines. Besides car scheduling, one of the spinoff benefits Sines sees from EDI is expedited cash flow. As soon as the delivery of a freight car is complete a bill can be transmitted to a shipper via EDI. This is being done now on a limited basis. MP has a pilot program with Dow Chemical and is speeding up its cash flow by two to four days. "You can pick up a good chunk of interest," says Sines.

But what about payment? Why not transfer funds electronically, too? Sines agrees that it's a good idea, but for obvious reasons shippers are not so quick to agree. Sines says that there is some discussion now with shippers about this, but "it's not in the hard negotiating stage yet." He suggests that electronic funds transfer could be included in a contract as part of a total service package.

Railroads emphasize that EDI does not eliminate the need for clerks—it just makes their jobs easier to perform.

By 1985 MP expects to send nearly 90% of its interline traffic under EDI waybills. Sines says that EDI allows MP to move a load as much as a full day ahead of time on weekdays and on weekends the railroad can pick up as much as 48-72 hours by moving a car under EDI.

Conrail, too, is moving a growing portion of its waybills through computers rather than ink. Right now about 33% of its terminating traffic is moving under EDI, though only 10% of its originating traffic enjoys EDI. The reason for that difference is that not all of the railroads Conrail interchanges with use EDI. Sims expects that the percentage will jump when Norfolk & Western adopts EDI this year.

Sims points out that certain traffic resists some of EDI's benefits. Intermodal business is one such example. With the wide array of special plans, rates, and contracts for intermodal, it is difficult to automatically generate a freight bill from waybill information. TOFC/COFC can easily move under an EDI waybill, but it is difficult to quickly produce an electronic freight bill from that information.

• **Labor's reaction.** Another problem railroads face as they make wider use of EDI is the reaction of organized labor. There have been reports that the Brotherhood of Railway and Airline Clerks (BRAC) has resisted the introduction of EDI on certain railroads. One railroad official points out that part of the benefit from EDI comes out of the reduction in time it takes to process interline car movements. Where a clerk might have had to enter 120-300 characters to duplicate a waybill, he now has to punch only 20-30 characters as he pulls up the bill for an incoming car and checks the data. This is where the chance for error is reduced, of course, but it also increases the union's apprehension over possible job losses due to EDI.

Conrail's Sims says, "We are trying to do this [phase in EDI] in such a manner that there will be a definite role for BRAC employees and so that we will not obviate the need for our employees."

With the transition to EDI transmission of waybills well under way, some problems are bound to come up. It is apparent, though, that the advantages are so significant that there is little to keep railroads from adopting EDI. And for an industry that sometimes gets stuck with the label "old fashioned," the leading role that railroads have taken in the development of EDI has to show some people that railroading has indeed emerged from the 19th century. When it comes to communications, TDCC's Guilbret says railroads are "progressive and aggressive." ■

Market

CARLOADINGS

Loadings of revenue freight in the week ended May 22 totaled 387,394 cars, according to the Association of American Railroads. This was a decrease of 10,020 cars, or 2.5%, compared with the corresponding week last year. Ton-miles generated by carloadings in the week ended May 22 are estimated at 16.7 billion, a decrease of 2.8% below the corresponding week of 1981. The 1981 week included the eighth week of the coal miners' strike.

REVENUES FREIGHT CARLOADINGS

Commodity	May 22 week	May 15 week
Grain	25,223	24,676
Other farm products	4,573	4,433
Metallic ores	23,643	21,192
Coal	120,027	119,236
Crushed stone, gravel & sand	10,337	10,164
Nonmetallic minerals	8,987	9,976
Grain mill products	11,660	11,744
Food & kindred products	13,947	13,762
Primary forest products	15,281	15,188
Lumber & wood products (except furniture)	6,410	6,010
Pulp, paper & allied products	16,657	16,415
Chemicals & allied products	22,123	23,657
Petroleum products	4,517	4,675
Stone, clay & glass products	10,172	10,303
Coke	4,532	4,596
Metals & products	9,745	9,744
Motor vehicles & equipment	18,093	16,964
Waste & scrap materials	8,622	8,667
Forwarder & shipper assn. traffic	8,027	8,433
All other carloads	44,547	41,952
LCL traffic	271	238
Total Cars Loaded	**387,394**	**382,025**
Cumulative total,	1982	1981
21 weeks	**7,866,552**	**8,707,447**
Estimated revenue ton-miles (billions), 21 weeks	**338.5**	**370.9**

PIGGYBACK LOADINGS

U.S. piggyback loadings for the week ended May 15, totaled 35,299 cars (3.5% above the corresponding 1981 week) and 65,593 trailers or containers (up 8.9% from 1981). Cumulative volume for the first 20 weeks of 1982 was 694,473 (up 8.3% from 1981) and 1,241,470 trailers or containers (up 6.5% from 1981).

CANADIAN CARLOADINGS

Canadian railway revenue freight loaded in the seven-day period ended May 7 totaled 5.2 million tons (up 0.1% from 1981). Cars loaded totaled 70,692 (down 5.4% from 1981). Cumulative loadings for 1982 were 80.7 million tons (down 8.7% from 1981).

• *CP Rail.*—Will install a $1.8-million Farinon DM-18 digital radio microwave system to provide trackside communications between Revelstoke and Glacier, B.C., 40 miles.

• *Metropolitan Atlanta Rapid Transit Authority.*—Placed a $3.8-million order with BSC Track Products, a British Steel subsidiary, for the supply of both running and contact rail scheduled for installation in 1983.

• *New York City Transit Authority.*—Awarded a $5.9-million contract to Parsons Brinckerhoff-Gibbs & Hill for review, inspection and testing of 325 R-62 IRT cars ordered from Kawasaki Heavy Industries. Parsons-Brinckerhoff will have its own staff at the Kawasaki main plant in Kobi, Japan, consisting of a chief inspector, a resident engineer, supervisors and inspectors. The staff will review designs, observe tests and inspect components and sub-assembly units.

• *Southern Pacific.*—Applied to the FRA for authority to install a traffic control system between Fauna, Tex., and Beaumont, 69 miles, and between Beaumont and Echo, La., 26 miles.

• *Freight cars and locomotives.*—The following report has been received from the AAR and the ARCI:

DELIVERED

	April		March	Four months	
	1982	1981	1982	1982	1981
Built new by carbuilders	2,265	3,792	2,032	7,656	17,975
Build new in RR shops	178	453	215	791	1,477
Built new—total	2,443	4,245	2,247	8,447	19,452
Rebuilt	136	125	148	518	446
TOTAL DELIVERED	**2,579**	**4,370**	**2,395**	**8,965**	**19,898**
Locomotives (new and rebuilt)	29	70	34	157	258

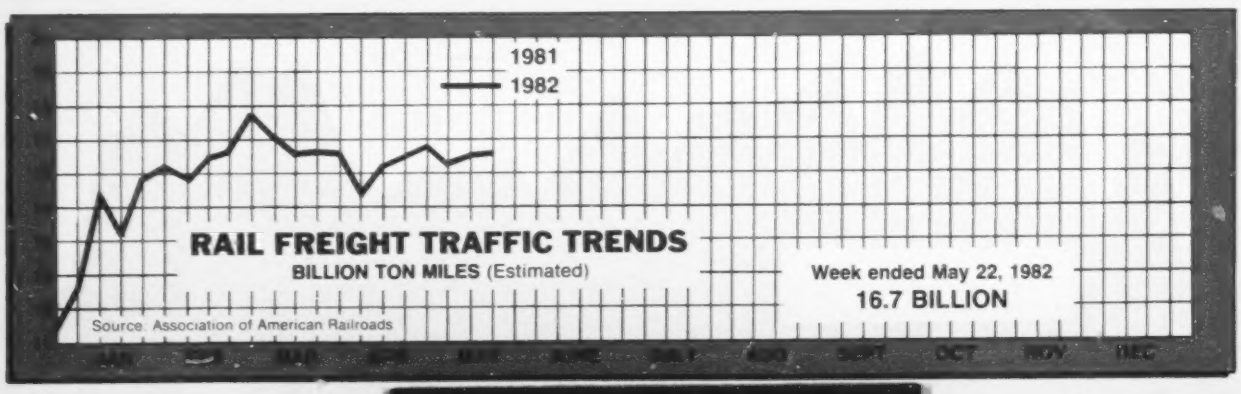
ORDERED

To be built new by carbuilders	539	1,737	1,485	3,592	7,602
To be built new in RR shops	0	25	0	25	
To be built new—total	539	1,762	1,485	3,592	7,627
To be rebuilt	0	0	0	0	600
TOTAL ORDERED	**539**	**1,762**	**1,485**	**3,592**	**8,227**

ON ORDER AND UNDELIVERED

	May 1		April 1	Average Backlog	
	1982	1981	1982	1982	1981
To be built new by carbuilders	9,685	35,920	11,546	11,670	39,849
To be built new in RR shops	875	3,052	1,053	1,175	3,672
To be built new—total	10,560	38,972	12,599	12,845	43,521
To be rebuilt	382	154	518	589	203
TOTAL ON ORDER	**10,942***	**39,126**	**13,117**	**13,434**	**43,724**
Locomotives (new and rebuilt)	188	341	185	207	437

*Due to revisions and cancellations of some orders, the May 1, 1982 backlog has been reduced by 135 cars.



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